LANDFIRE Potential Vegetation Products for Alaska

Greg Dillon
USDA Forest Service
Missoula Fire Sciences Laboratory

ROCKY MOUNTAIN RESEARCH STATION
FireLab
MISSOULA, MONTANA

SANBORN

LANDFIRE™

Introduction

- Landscape Fire and Resource Management Planning Tools Project

Introduction

- Landscape Fire and Resource Management Planning Tools Project
- Emphasis has largely been on fire applications

Link to National Map LANDFIRE

LANDFIRE National Schedule

Principal purposes of LANDFIRE data products:

- Provide national-level, landscape-scale geospatial products to support fire and fuels management planning.
- Provide consistent fuels data to support fire planning, analysis, and budgeting to evaluate fire management alternatives.
- Provide landscape–scale, cross-boundary strategic products for fire and land management activities.
- Supplement planning and management activities, including monitoring, that require consistent vegetation data.
- Supplement strategic and tactical planning for fire operations.
- Supplement and assist in:
  - Identification of areas across the nation at risk due to accumulation of wildland fuel
  - Prioritization of national hazardous fuel reduction projects
  - Improved collaboration between agencies with regard to fire and other natural resource management
  - Modeling of real-time fire behavior to support tactical decisions to ensure sufficient wildland firefighting capacity and safety.
  - Regional modeling of potential fire behavior and effects to strategically plan projects for hazardous fuel reduction and restoration of ecosystem integrity on fire-adapted landscapes
  - Community and firefighter protection, effective resource allocation, and collaboration between agencies and the public

Introduction

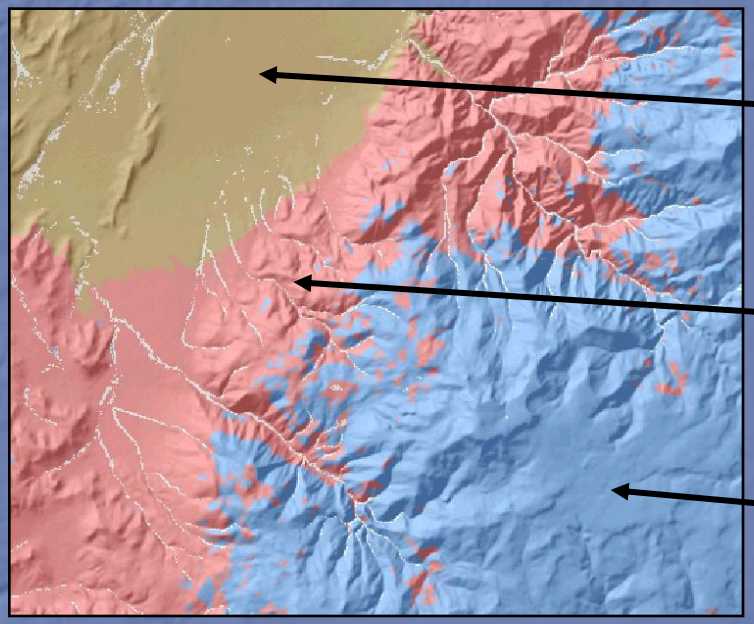
- Landscape Fire and Resource Management Planning Tools Project
- Emphasis has largely been on fire applications
- There was significant effort given to creating products that are:
  - as ecologically sound as possible
  - suitable for a variety of ecological and land management uses

Overview

- Concepts and Definitions
  - Why map potential vegetation?
  - How does LANDFIRE define potential vegetation?
- Mapping methods
- Discussion of caveats

Concepts and Definitions:
Why map potential vegetation?

- To compartmentalize the landscape
  - Units of relatively homogenous biophysical conditions
  - Units that can be related to vegetation



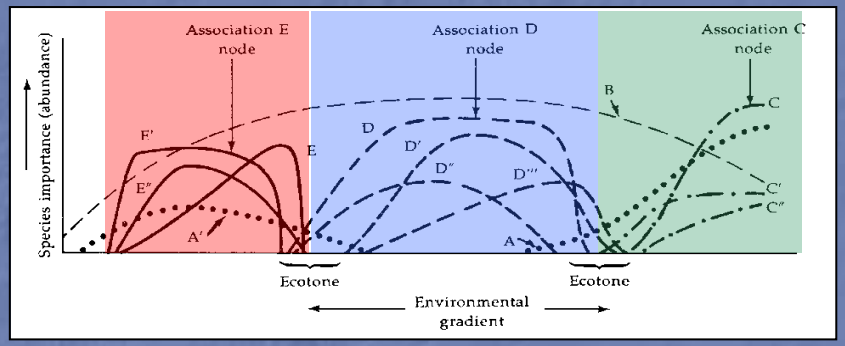
High temperature, Low precipitation: "xeric shrubs"

Moderate temp., Moderate precip.: "foothill shrubs and woodland"

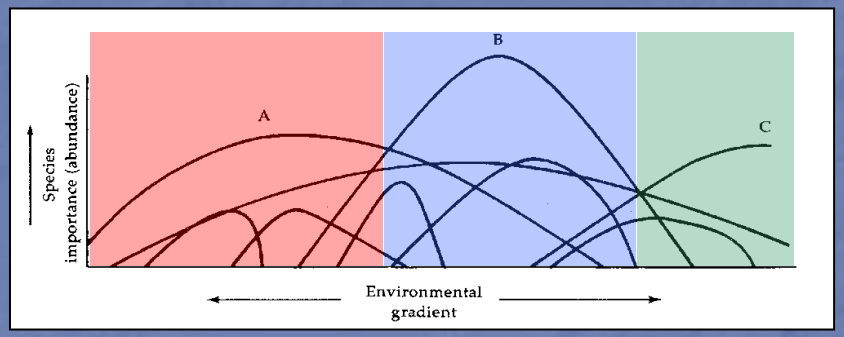
Low temperature, High precipitation: "conifer forest"

Concepts and Definitions:
How do we define the units?

- Community unit concept (organismic view *sensu* Clements)



- Continuum concept (*sensu* Gleason, Whittaker, and others)



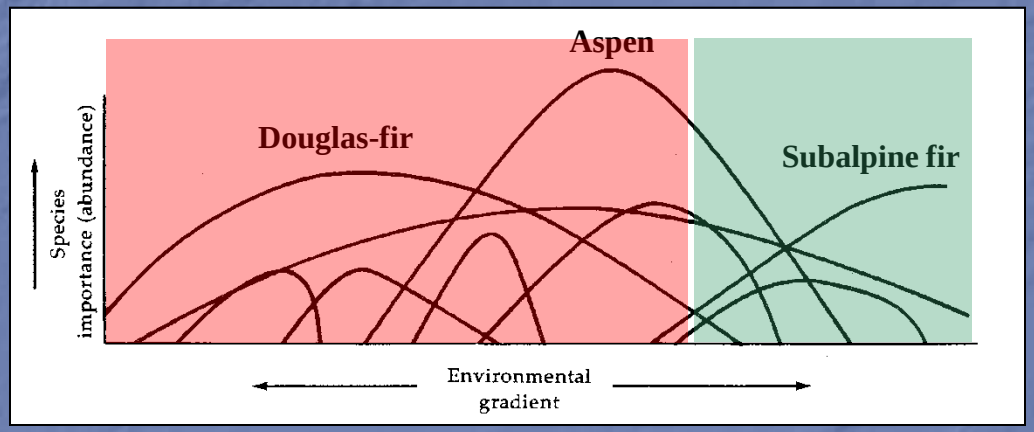
- → NatureServe's Ecological Systems

NatureServe

Figures adapted from Barbour, Burk, and Pitts (1987)

Concepts and Definitions:
LANDFIRE's potential vegetation definitions

- Environmental Site Potential (ESP) - native vegetation that could be supported at a given site in the absence of disturbance, based on the biophysical environment (named by the "climax" community or theoretical endpoint of succession)

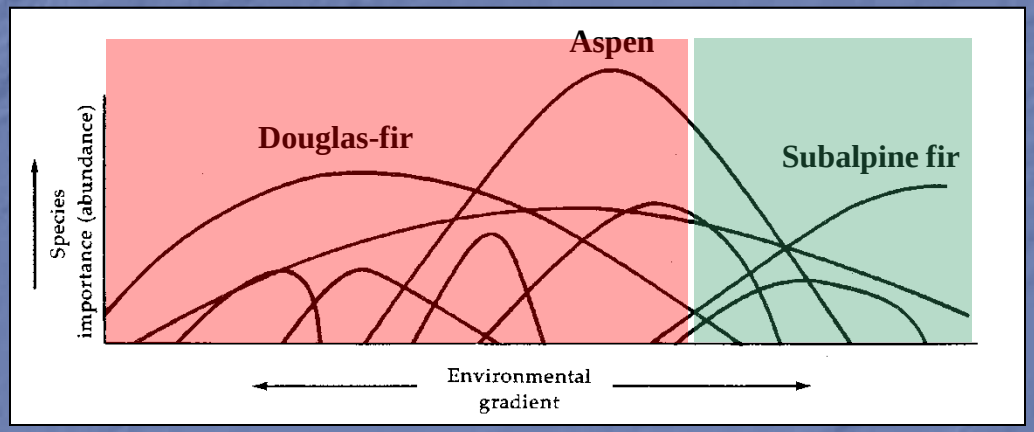


Objective: map of distinct environments

Figure adapted from Barbour, Burk, and Pitts (1987)

Concepts and Definitions:
LANDFIRE's potential vegetation definitions

- Environmental Site Potential (ESP) - native vegetation that could be supported at a given site *in the absence of disturbance*, based on the biophysical environment (named by the "climax" community or theoretical endpoint of succession)

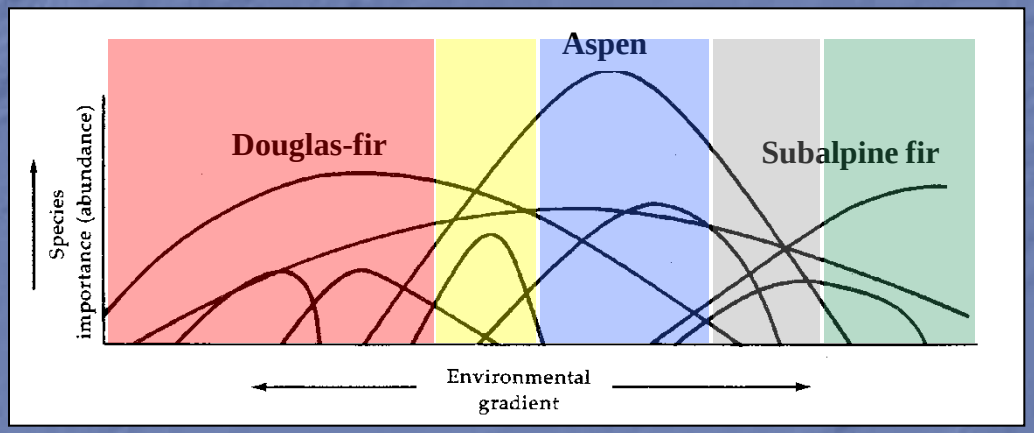


Objective: map of distinct environments

Figure adapted from Barbour, Burk, and Pitts (1987)

Concepts and Definitions:
LANDFIRE's potential vegetation definitions

- Biophysical Settings (BpS) - native vegetation that may have been dominant on the landscape during a pre-settlement reference period, based on the current biophysical environment and an approximation of the historical disturbance regime

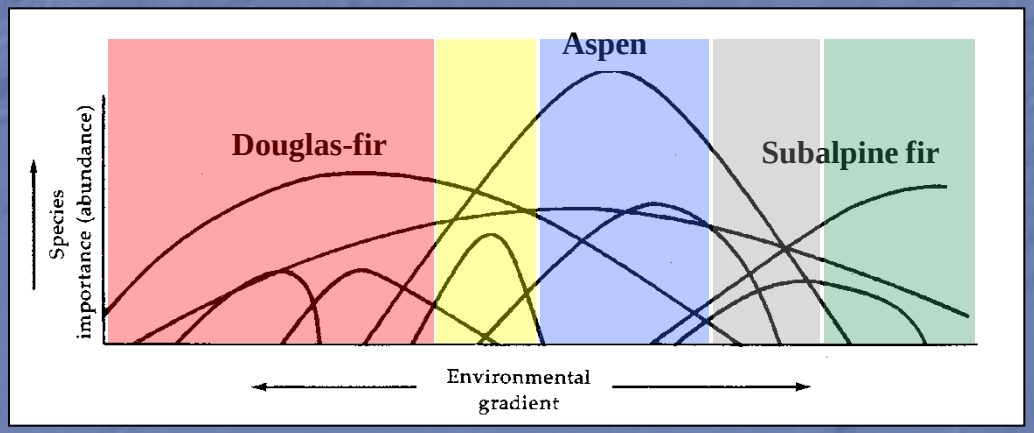


Objective: basis for historic reference conditions

Figure adapted from Barbour, Burk, and Pitts (1987)

Concepts and Definitions:
LANDFIRE's potential vegetation definitions

- Biophysical Settings (BpS) - native vegetation that may have been dominant on the landscape during a *pre-settlement reference period*, based on the current biophysical environment and an approximation of the historical disturbance regime

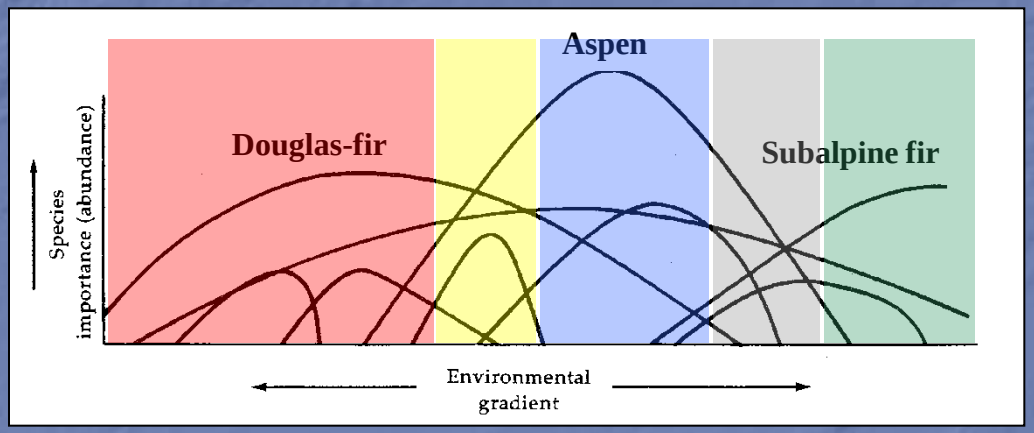


Objective: basis for historic reference conditions

Figure adapted from Barbour, Burk, and Pitts (1987)

Concepts and Definitions:
LANDFIRE's potential vegetation definitions

- Biophysical Settings (BpS) - native vegetation that may have been dominant on the landscape during a *pre-settlement reference period*, based on the current biophysical environment and an *approximation of the historical disturbance regime*



Objective: basis for historic reference conditions

Figure adapted from Barbour, Burk, and Pitts (1987)

Mapping methods: ESP

- Underlying assumption:
  - in recently undisturbed upland areas ESP is equal to the EVT
- Result:
  - For most pixels, ESP = EVT
  - For areas identified as disturbed, ESP values were mapped based on logical rules or spatial modeling

Mapping methods: ESP

- Logical rulesets for mapping ESP in disturbed areas, example:

ECOLOGICAL SYSTEM	COMMENTS ON SUCCESSION	ESP	BPS CONSIDERATIONS
Boreal Mesic Scrub Birch-Willow Shrubland	If alpine or subalpine, then seral to Boreal Mesic Scrub Birch-Willow Shrubland	Boreal Mesic Scrub Birch-Willow Shrubland	Boreal Mesic Scrub Birch-Willow Shrubland was split into Boreal and Alaska Sub-boreal variants for BpS modeling so that a longer fire return interval could be applied to the Sub-boreal variant.
	If below treeline (below the woodlands also) and recently burned (last 20 years), then seral to the nearest ESP	Various ESP's, such as: Boreal White Spruce Forest, Boreal Mesic Black Spruce Forest, Boreal Mesic Birch-Aspen Forest, Boreal Black Spruce Wet-Mesic Slope Woodland	Boreal Mesic Black Spruce Forest was split into Boreal and Alaska Sub-boreal variants for BpS modeling.

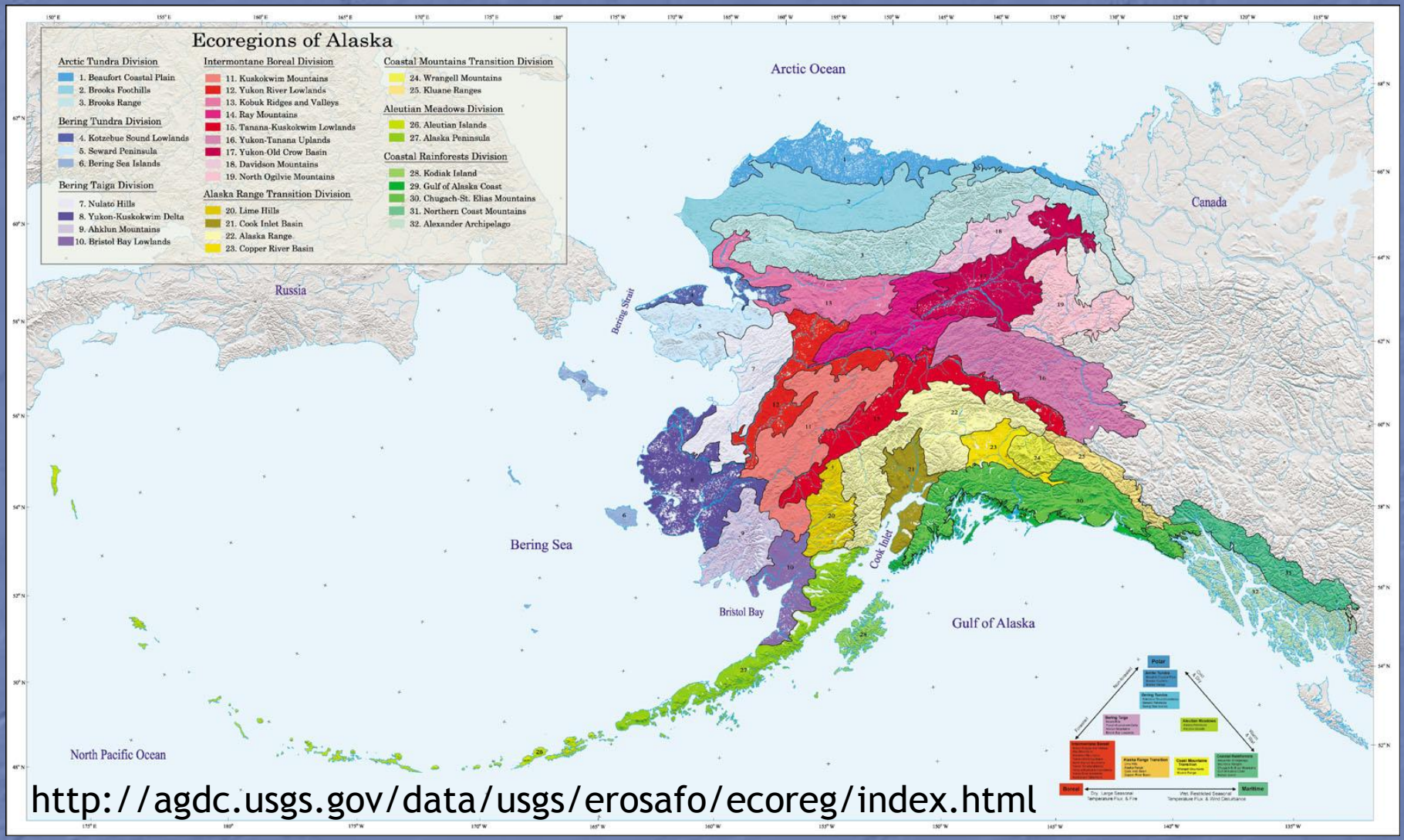
Mapping methods: ESP

- Spatial modeling:
  - Many ancillary data layers in Alaska are too coarse (soils) or are of relatively poor quality (elevation, slope, aspect, etc.)
  - In some cases, Sanborn used older pre-disturbance Landsat TM scenes to help model ESP in disturbed area
  - Sampled pixels from areas where ESPs seemed correct and used those to train models

Mapping methods: BpS

- Modified ESP map units as needed to fit BpS descriptions in the models produced by The Nature Conservancy
  - Some map units were split based on geographic regions, elevation, or other criteria to reflect subtle differences in species composition and environmental conditions that lead to differences in disturbance processes and successional dynamics
  - Other map units lumped to reflect functional complexes (e.g., wetlands)

Mapping methods:
Using ecoregions



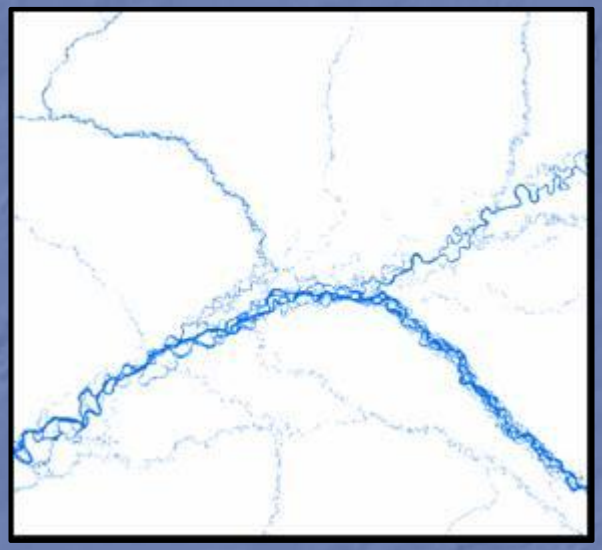
http://agdc.usgs.gov/data/usgs/erosafo/ecoreg/index.html

Mapping methods:
Using valley bottom zones (VBZ)

- Input data
  - 30 meter digital elevation models (DEM)
  - National Hydrography Dataset (NHD)
    - Line features representing stream/river center lines
    - Polygon features representing shorelines of larger lotic features (wide rivers)
- Process
  - Convert NHD features to raster (30m resolution grid)
  - For every NHD pixel, determine the upslope area within an elevation threshold (5m)
  - Using a focal window algorithm, define VBZ areas as associated with “small streams” or “large streams”

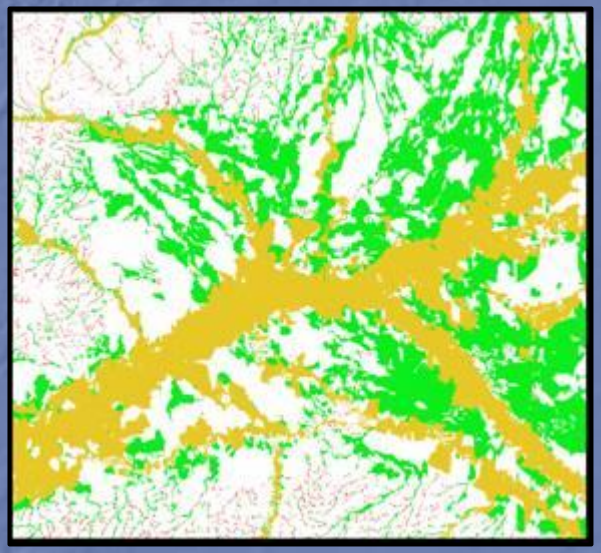
Mapping methods:
Using valley bottom zones (VBZ)

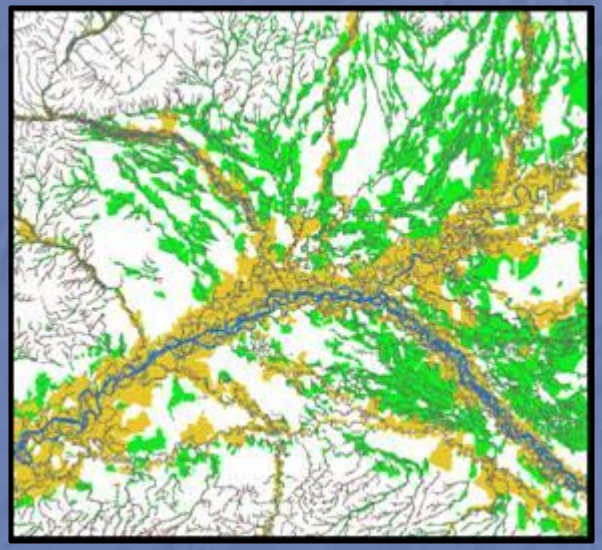
NHD lines



NHD polygons

VBZ (5m)





VBZ (5m) with NHD

Use of LANDFIRE Potential Vegetation Data: Caveats

- Problems with map units
  - Sometimes too fine, sometimes too coarse
  - May require adjustments in the future
- Mapping issues
  - Generally we tried to ensure that maps fit descriptions from NatureServe and TNC
  - Where problems existed in the EVT, they also came through to ESP and BpS
- Appropriate scale of use
  - National to regional